Résumé. The Bradford sand is fine but porous; constant in thickness; homogeneous in section; the character of the sections remaining the same over a very wide area.

The Venango sands are sometimes coarse, pebbly and porous, and sometimes fine, compact and clayey; variable in thickness; heterogeneous in section and subject to sudden changes in very short distances.

The difference in the structure of the sands, when considered in connection with their relative productiveness, is a strong argument in support of the view which has been accepted by the *best informed* of our geologists that the sands are only reservoirs or sponges which serve to hold the oil, coming almost entirely from an inferior formation to which it is indigenous.

The conditions under which these two sands were deposited must have been essentially different. The Venango sands were undoubtedly shore and shallow water deposits. The currents, by which the sediments forming the group were transported, were evidently rapid and shifting. It has been suggested that the sands may have been laid down in a river bed. This would necessitate dry land at the time, on either side of the territory where the sands are at present found.

The Bradford sand was possibly deposited in deeper water, by a slower and more constant current. It does not bear any evidences of being a shore deposit, but was probably formed in a bay or estuary.

An Obituary Notice of the Late John W. Harden. By J. P. Lesley.

(*Read before the American Philosophical Society, March* 5, 1880.)

John W. Harden was born at Leicester, England, June 19th, 1816, and died at Philadelphia, November 8th, 1879.

He was versed in the arts of Horticulture and Floriculture, and for a number of years followed them professionally. Was especially successful in designing, ornamenting and laying out estates, notably those of Hon. Capt. Cust, Wormleybury, Hertfordshire and Sir Ralph Howard, Bart., Craven Cottage on the Thames.

He commenced practice as a Mining Engineer in 1846, and in that year took the management of the Hawkesbury Colliery, near Coventry, England. He was the means of introducing into the Warwickshire coal field most of the modern improvements at that time only in use at the best collieries in the North of England. Wire ropes took the place of hemp ropes

and chains, guides and carriages were introduced, high speed direct acting hoisting engines replacing the slow, geared machine of the condensing type. These improvements required corresponding facilities, and extended operations underground, so that much larger areas of mineral were by these means won through one shaft.

He left this colliery in 1857 for the purpose of sinking the New Shafts for the Exhall Coal Company, for winning the coal and ironstone underlying the Blakeslee estate, to the dip of the Hawkesbury Colliery. He succeeded in passing the waterbearing strata and reaching coal, although a former attempt by others had failed. He here met with an accident from which it was thought he could not recover. In descending the shaft he was caught between the carriage and surface plate; receiving injuries about the head and face which disfigured him, and no doubt shortened his life many years. After his recovery he made a professional trip to this country, from which he derived so much benefit that he determined to settle in America, and did so in 1865, and for a time had charge of the Anthracite Mines of the Plymouth Coal Company, in Luzerne county, Pennsylvania.

In 1866, he with his sons, established and maintained a large professional practice in Wilkesbarre until 1870, when he removed to Philadelphia, continuing practice until physical disability confined him to the house. His last report was made in August, 1874, for the Cameron Coal Company. He retained all his faculties, and continued to give advice up to within two weeks of his death.

He was married three times, and leaves a widow and two children, besides four grown sons by his first marriages.

He was a member of the North of England Institute of Mining and Mechanical Engineers, the American Philosophical Society, and the American Institute of Mining Engineers.

My acquaintance with Mr. Harden commenced on board the Liverpool steamer in the autumn of 1863. I was going to make a special investigation of the alleged success of a new process for hardening the heads of rails, which led me on to an examination of the Bessemer experiments in various parts of Europe; and he was returning from the journey to which I have already alluded.

His face was disfigured by the terrible injuries it had received; but that could not conceal the dignity and amiability which was natural to it. He was attractive in all respects, and I soon found the utmost satisfaction in our intercourse. Sir Henry Holland was our constant companion in our walks on deck, and it would be hard to say which of the two, unlike as they were, inspired one with more pleasure.

No one could long know Mr. Harden without loving him and confiding in him. His judgments of men's motives were kind; his criticisms of their acts tempered by justice and guided by a long experience; his opinions were liberal and manly; his business decisions were gravely and

concisely expressed, after a close and systematic statement of all the facts of the case after personal examination. He impressed every one with the feeling that they were dealing with a man who professed to know only certain things, and to know these because he had used or made opportunities for learning them well, before he spoke of them. His uprightness was so evidently ingrained that it seemed to hold no relations with either an educated sense of duty, public opinion, or business interests; and the perfect straightforwardness with which he treated everything and everybody gave to his carriage and demeanor the air of nobility.

These traits of character with which I could not help being greatly impressed during our voyage, and which merely made me at that time look upon my companion of a week as one of the finest specimens of man I would be likely to encounter, became in after years the basis of a warm friendship between us.

In the following year I was called upon to designate the Superintendent of an extensive colliery near Wilkesbarre, to equip which it was necessary to make both sinkings and buildings, lay railways and throw a large bridge across the Susquehanna river. I was fortunate enough to induce Mr. Harden to accept the responsible position, and he took this opportunity to settle with his sons in America. Had his accident of 1863 not implanted the seeds of paralysis in his brain, we should not now be lamenting the long sufferings and death of a remarkable man; for, during a number of years he acquired a reputation among our coal and iron men, which would have placed him foremost among professional experts of Mining Engineering in Pennsylvania.

His physical energy and endurance so well supported his intellectual ability; his long experience was so completely at the command of a good judgment; the warmth of his heart colored so charmingly his inflexible and proud integrity; while natural force of will and earnestness of purpose made his executive plans rapid and direct, and his methods so thoroughgoing as to be the reverse of that penny-wise pound-foolish, hand to mouth manner so common with Americans,—that life alone failed to the establishment of his fame among us.

Such was the man whose name stands worthily on the list of members of our Society.